

FQ5-561

23

Claims:

1. A Point-to-Point Protocol (PPP) termination device in an access network system by which a subscriber gets access to a backbone network, comprising:

a first interface to a Digital Subscriber Line  
5 Access Multiplexer (DSLAM);  
a second interface to a backbone network;  
a Point-to-Point Protocol (PPP) link controller for  
establishing and disconnecting a PPP link;  
a header processor for converting between  
10 a network-layer packet and a PPP data packet including  
the network-layer packet and; and  
a switch for switching a connection among the first  
interface, the second interface, the PPP link controller, and  
the header processor, depending on which one of a PPP data packet  
15 and a link control packet is inputted, wherein the link control  
packet is used for link establishment and disconnection.

2. A Point-to-Point Protocol (PPP) termination device in an access network system by which a subscriber gets access to a backbone network, comprising:

20 a first interface for inputting and outputting PPP  
packets in Asynchronous Transfer Mode (ATM) cells from and to  
a corresponding Digital Subscriber Line Access Multiplexer

FQ5-561

24

(DSLAM);

a second interface for inputting and outputting network-layer packets in ATM cells from and to the backbone network;

5 a PPP link controller for establishing and disconnecting a PPP link;

a packet processor for converting between a network-layer packet and a PPP data packet including the network-layer packet and controlling cell forwarding; and

10 an ATM switch for switching ATM cells among the first interface, the second interface, the PPP link controller, and the packet processor, depending on which one of a PPP data packet in ATM cells and a link control packet in ATM cells is inputted, wherein the link control packet is used for link establishment and disconnection.

3. The PPP termination device according to claim 2, wherein the packet processor comprises:

a header processor; and

20 a first AAL5-SAR (ATM Adaptation Layer type 5 - Segmentation And Reassembly) section,

wherein the header processor determines which one of a PPP data packet in ATM cells and a link control packet in ATM cells is inputted from the first interface through the first AAL5-SAR section and, when the PPP data packet has been inputted  
25 through the first AAL5-SAR section, generates a network-layer

EQ5-561

25

packet by removing a PPP header of the PPP data packet, and the first AAL5-SAR section segments the network-layer packet into ATM cells to be forwarded to the second interface by the ATM switch.

5           4.     The PPP termination device according to claim 3,  
wherein, when the link control packet has been inputted from  
the first interface through the first AAL5-SAR section, the  
first AAL5-SAR section segments the link control packet into  
ATM cells to be forwarded to the PPP link controller by the ATM  
10   switch, wherein the PPP link controller performs a link  
establishment procedure based on the link control packet in ATM  
cells.

15           5.     The PPP termination device according to ~~claim 3,~~  
wherein, when receiving a network-layer packet in ATM cells from  
the backbone network, the packet processor performs PPP  
encapsulation to generate a PPP data packet from  
the network-layer packet and the first AAL5-SAR section segments  
the PPP data packet into ATM cells to be forwarded to the first  
interface by the ATM switch.

20           6.     The PPP termination device according to claim 4,  
wherein the PPP link controller comprises:  
            a second AAL5-SAR section; and  
            a processor,

EQ5-561

26

wherein, when receiving the link control packet from the first interface through the second AAL5-SAR section, the processor generates a response control packet in response to the link control packet and the second AAL5-SAR section segments the response control packet into ATM cells to be forwarded to the first interface by the ATM switch.

7. A Point-to-Point Protocol (PPP) termination device in an access network system by which a subscriber gets access to a backbone network, comprising:

a first interface for inputting and outputting PPP packets over SONET (Synchronous Optical Network) from and to a corresponding Digital Subscriber Line Access Multiplexer (DSLAM), wherein the first interface includes a first packet processor for determining which one of a PPP data packet and a link control packet is inputted, converting between a packet and ATM cells, and controlling cell forwarding;

a second interface for inputting and outputting network-layer packets over SONET from and to the backbone network, wherein the second interface includes a second packet processor for converting between a network-layer packet and a PPP data packet including the network-layer packet, converting between a packet and ATM cells, and controlling cell forwarding;

a PPP link controller for establishing and disconnecting a PPP link; and

FQ5-561

27

an ATM switch for switching ATM cells among the first interface, the second interface, and the PPP link controller, depending on which one of a PPP data packet and a link control packet is inputted.

5           8.     The PPP termination device according to claim 7, wherein the first packet processor comprises:

          a first header processor; and

          a first AAL5-SAR (ATM Adaptation Layer type 5 - Segmentation And Reassembly) section,

          wherein the first header processor determines which one of a PPP data packet and a link control packet is inputted from the first interface and, when the PPP data packet has been inputted, generates a network-layer packet by removing a PPP header of the PPP data packet, and the first AAL5-SAR section  
15       segments the network-layer packet into ATM cells to be forwarded to the second interface by the ATM switch.

          9.     The PPP termination device according to claim 8, wherein, when the link control packet has been inputted from the first interface, the first AAL5-SAR section segments the  
20       link control packet into ATM cells to be forwarded to the PPP link controller by the ATM switch, wherein the PPP link controller performs a link establishment procedure based on the link control packet.

28

| Case | Age | Sex | Occupation | Onset | Duration | Course  | Outcome  |
|------|-----|-----|------------|-------|----------|---------|----------|
| 1    | 25  | M   | Student    | 1980  | 10 years | Chronic | Recovery |
| 2    | 30  | F   | Housewife  | 1982  | 5 years  | Chronic | Recovery |
| 3    | 35  | M   | Teacher    | 1985  | 3 years  | Chronic | Recovery |
| 4    | 40  | F   | Manager    | 1988  | 2 years  | Chronic | Recovery |
| 5    | 45  | M   | Engineer   | 1990  | 1 year   | Chronic | Recovery |
| 6    | 50  | F   | Retired    | 1992  | 6 months | Chronic | Recovery |
| 7    | 55  | M   | Farmer     | 1995  | 4 months | Chronic | Recovery |
| 8    | 60  | F   | Homemaker  | 1998  | 3 months | Chronic | Recovery |
| 9    | 65  | M   | Retired    | 2000  | 2 months | Chronic | Recovery |
| 10   | 70  | F   | Homemaker  | 2002  | 1 month  | Chronic | Recovery |

5                    wherein, when receiving a network-layer packet over  
SONET from the backbone network, the second header processor  
performs PPP encapsulation to generate a PPP data packet from  
the network-layer packet and the second AAL5-SAR section  
segments the PPP data packet into ATM cells to be forwarded to  
10 the first interface by the ATM switch.

15                    wherein, when receiving the link control packet from  
the first interface through the third AAL5-SAR section, the  
processor generates a response control packet in response to  
the link control packet and the third AAL5-SAR section segments  
the response control packet into ATM cells to be forwarded to  
20 the first interface by the ATM switch.

12. An access network system comprising:  
a plurality of subscriber computers;  
a plurality of Remote ADSL Transceiver Units  
(ATU-Rs) each connected to the subscriber computers;

FQ5-561

29

a plurality of Digital Subscriber Line Access Multiplexers (DSLAMs), each of which accommodates a plurality of ATU-Rs;

an access gateway to a backbone network, the access gateway accommodating a plurality of DSLAMs,

wherein the access gateway comprises:

a first interface to a corresponding Digital Subscriber Line Access Multiplexer (DSLAM);

a second interface to the backbone network;

a Point-to-Point Protocol (PPP) link controller for establishing and disconnecting a PPP link with an ATU-R;

a header processor for converting between a network-layer packet and a PPP data packet including the network-layer packet and; and

a switch for switching a connection among the first interface, the second interface, the PPP link controller, and the header processor, depending on which one of a PPP data packet and a link control packet is inputted, wherein the link control packet is used for link establishment and disconnection.

0993440-032304  
T02220-042660